

CLAIMS

What is claimed is:

1. A carbon media filter element with urethane frame and seal comprising carbon filter media comprising a granular carbon layer sandwiched between first and second backing layers and forming a sheet having a perimeter with first and second axial ends distally oppositely axially spaced along an axis, and first
5 and second lateral ends distally oppositely laterally spaced relative to said axis and extending axially between said first and second axial ends, said sheet being pleated along axially extending bend lines to provide a plurality of pleats extending axially between said first and second axial ends, a border member composed of urethane and comprising a combined structural frame and seal extending along said perimeter and
10 providing both the support frame for said media and a seal along said ends of said sheet retaining carbon granules between said first and second backing layers and preventing escape of carbon granules out of said ends.

2. The carbon media filter element according to claim 1 wherein said pleats have a pleat height extending between said bend lines along a height direction normal to said axial direction and normal to said lateral direction, and wherein said border member has a height extending along said height direction and at
5 least as great as the height of said pleats and covering and encapsulating said first and second axial ends including said carbon layer and said first and second backing layers.

3. The carbon media filter element according to claim 2 wherein said height of said border member is uniform along the entire said perimeter of said sheet including at said axial ends and said lateral ends.

4. The carbon media filter element according to claim 2 wherein said border member has a first section extending along said height direction and

providing said support frame and said seal, and has a second section extending laterally outwardly from said first section and resiliently compressible along said height direction for gasket sealing, both of said first and second sections being composed of urethane.

5. The carbon media filter element according to claim 2 wherein said border member has an L-shape comprising a first leg extending along said height direction, and a second leg extending laterally outwardly from said first leg, both of said first and second legs being composed of urethane.

6. Manufacturing apparatus for making a carbon media filter element with urethane frame and seal, said carbon media filter element comprising carbon filter media comprising a granular carbon layer sandwiched between first and second backing layers and forming a sheet having a perimeter with first and second axial ends distally oppositely axially spaced along an axis, and first and second lateral ends distally oppositely laterally spaced relative to said axis and extending axially between said first and second axial ends, said sheet being pleated along axially extending bend lines to provide a plurality of pleats extending axially between said first and second axial ends, and a border member composed of urethane and comprising a combined structural frame and seal extending along said perimeter and providing both the support frame for said media and a seal along said ends of said sheet retaining carbon granules between said first and second backing layers and preventing escape of carbon granules out of said ends, said manufacturing apparatus comprising a mold base having a plurality of fins extending axially between first and second axial ends, and having a height extending upwardly along said height direction to upper peaks defining axially extending bend lines of said sheet, said upper peaks being laterally spaced by lower valleys therebetween also defining axially extending bend lines of said sheet, said base having an inner perimeter around said fins and having first and second axial ends distally oppositely axially spaced

20 along said axis, and having first and second lateral ends distally oppositely laterally
spaced relative to said axis and extending axially between said first and second axial
ends of said inner perimeter, and having a plurality of corners joining said axial and
lateral ends of said inner perimeter, said inner perimeter providing a trough holding
urethane therein, and a mold top having a plurality of fins extending axially between
25 first and second axial ends, and having a height extending downwardly along said
height direction to lower peaks defining axially extending bend lines of said sheet,
said lower peaks being laterally spaced by upper valleys therebetween also defining
axially extending bend lines of said sheet, said mold top mating with said mold base
with said sheet therebetween being pleated by respective said fins and with said
30 urethane in said trough molding to said ends of said sheet to provide said combined
structural frame and seal border member.

7. The manufacturing apparatus according to claim 6 wherein one
of said mold base and said mold top has one or more injection ports therethrough
communicating with said trough for injecting said urethane thereinto.

8. A method for making a carbon media filter element with
urethane frame and seal, said carbon media filter element comprising carbon filter
media comprising a granular carbon layer sandwiched between first and second
backing layers and forming a sheet having a perimeter with first and second axial
5 ends distally oppositely axially spaced along an axis, and first and second lateral ends
distally oppositely laterally spaced relative to said axis and extending axially between
said first and second axial ends, said sheet being pleated along axially extending bend
lines to provide a plurality of pleats extending axially between said first and second
axial ends, and a border member composed of urethane and comprising a combined
10 structural frame and seal extending along said perimeter and providing both the
support frame for said media and a seal along said ends of said sheet retaining carbon
granules between said first and second backing layers and preventing escape of

carbon granules out of said ends, said method comprising providing a mold base having a plurality of fins extending axially between first and second axial ends, and
15 having a height extending upwardly along said height direction to upper peaks defining axially extending bend lines of said sheet, said upper peaks being laterally spaced by lower valleys therebetween also defining axially extending bend lines of said sheet, providing said base with an inner perimeter around said fins and having first and second axial ends distally oppositely axially spaced along said axis, and
20 having first and second lateral ends distally oppositely laterally spaced relative to said axis and extending axially between said first and second axial ends of said inner perimeter, and having a plurality of corners joining said axial and lateral ends of said inner perimeter, said inner perimeter providing a trough, providing a mold top having a plurality of fins extending axially between first and second axial ends, and having a
25 height extending downwardly along said height direction to lower peaks defining axially extending bend lines of said sheet, said lower peaks being laterally spaced by upper valleys therebetween also defining axially extending bend lines of said sheet, providing said sheet between said mold base and said mold top and mating said mold base and said mold top with said sheet therebetween to pleat said sheet by respective
30 said fins, and providing urethane in said trough and molding said urethane to said ends of said sheet to provide said combined structural frame and seal border member.

9. The method according to claim 8 comprising pleating said sheet between said fins of said mold base and said fins of said mold top prior to introduction of urethane into said trough.

10. The method according to claim 8 comprising providing at least one injection port through at least one of said mold base and said mold top, and injecting molten urethane into said trough to provide said combined structural frame and seal border member.